ABSTRACT

A refrigeration system comprising a compressor for compressing a refrigerant, a condenser for condensing refrigerant to a liquid, an evaporator for evaporating liquid refrigerant from the condenser to a gas, an inner control loop for optimizing a supply of liquid refrigerant to the evaporator, and an outer control loop for optimizing a level of refrigerant in the evaporator, said outer control loop defining a supply rate for said inner control loop based on an optimization including measurement of evaporator performance, and said inner control loop optimizing liquid refrigerant supply based on said defined supply rate. Independent variables, such as proportion of oil in refrigerant, amount of refrigerant, contaminants, non-condensibles, scale and other deposits on heat transfer surfaces, may be estimated or measured. A model of the system and/or a thermodynamic model approximating the system, for example derived from temperature and pressure gages, as well as power computations or measurements, is employed to determine or estimate the effect on efficiency of deviance from an optimal state. Various methods are provided for returning the system to an optimal state, and for calculating a cost-effectiveness of employing such processes.